

We claim:

1 1. A drilling mud reclamation system comprising:

2 (a) a mud inlet line adapted to be connected to a source of solids-laden drilling
3 mud;

4 (b) a first stage centrifuge provided with the mud from the source for separating
5 the heavy weight solid components from the mud and forming a first stage
6 liquid discharge;

7 (c) a second stage centrifuge provided with the first stage liquid discharge for
8 removing lighter weight solid components in the first stage liquid discharge
9 and for forming a second stage liquid discharge and a second stage solids
10 discharge defining a weight;

11 (d) a mass flow sensor for measuring weight of the second stage solids discharge;
12 and

13 (e) a flow rate sensor for measuring the flow rate of first stage liquid discharge
14 through the second stage centrifuge.

1 2. The system of claim 1 including first and second stage pumps connected to the
2 respective inputs of said first and second stage centrifuges.

1 3. The system of claim 1 wherein the first stage liquid discharge is input into a surge
2 tank and the surge tank connects through a motor-driven outlet valve to the second stage
3 centrifuge.

1 4. The system of claim 3, further comprising a sensor for measuring liquid level in the
2 surge tank.

1 5. The system of claim 1, wherein the mass flow sensor communicates with the second
2 stage liquid discharge from the second stage centrifuge, and wherein the mass flow sensor
3 comprises:

4 a. a liquid receiving tank;

5 b. a liquid level indicator for indicating liquid level in the liquid receiving tank;
6 and

7 c. a weight sensor to measure the weight of the liquid in the tank.

1 6. The system of claim 5, wherein the mass flow sensor is adapted for a determination
2 of the difference in solids into and out of the second stage centrifuge.

1 7. The system of claim 5, wherein the liquid receiving tank is mounted for axial rotation
2 on an axis.

1 8. The system of claim 1, wherein the second stage centrifuge forms a second stage
2 solids discharge and the mass flow sensor communicates with the second stage solids
3 discharge.

1 9. The system of claim 8, further comprising a cuttings drier to receive the second stage
2 solids discharge and to remove liquid from the second stage solids discharge.

1 10. The system of claim 9, further comprising:

2 a. first and second stage pumps connected to the respective inputs of said first
3 and second stage centrifuges; and

4 b. a central processor for monitoring and controlling the first and second stage
5 centrifuges, the first and second stage pumps, and the cuttings drier.

1 11. The system of claim 1, further comprising a central processor for monitoring and
2 controlling the operation of the first and second stage centrifuges.

1 12. The system of claim 2, further comprising a central processor for monitoring and
2 controlling the operation of the first and second stage pumps.

1 13. The system of claim 12, wherein the central processor controls the operation of the
2 second stage pump at the point in its operational characteristic for the maximum removal of
3 lighter weight solid components from the drilling mud.

1 14. The system of claim 13, further comprising a first mud flow sensor on the first stage
2 pump and a second mud flow sensor on the second stage pump.

1 15. The system of claim 14, wherein the central processor is adapted to calculate the
2 quantity of low gravity solids removed by the reclamation system based on the mud flow
3 sensed by the second mud flow sensor and the weight of solids removed by the second stage
4 centrifuge as sensed by the mass flow sensor.

1 16. The system of claim 15, wherein the central processor is further adapted to calculate
2 economic savings from the quantity of drilling mud which need not be added to the system
3 for dilution purposes.

1 17. The system of claim 15, wherein the central processor is further adapted to modify
2 the operation of the second stage centrifuge based on the mud flow sensed by the second
3 mud flow sensor and the weight of solids removed by the second stage centrifuge as sensed
4 by the mass flow sensor.

1 18. The system of claim 12, further comprising:

2 a. means for determining the quantity of high gravity solids removed by the first
3 stage centrifuge; and

4 b. wherein the central processor is adapted to vary the bowl speed of the first
5 stage centrifuge to maximize the high gravity solids content of the first
6 centrifuge solids discharge.

1 19. A method of determining the effectiveness of a centrifuge in removing solids from
2 a solids laden liquid, comprising the steps of:

- 3 a. measuring the weight and flow rate of a predetermined volume of a sample
4 of the solids-laden liquid;
- 5 b. processing the solids laden liquid through the centrifuge to remove solids
6 from the solids laden liquid to produce a centrate and a solids discharge;
- 7 c. measuring the weight and flow rate of the predetermined volume of the
8 centrate;
- 9 d. comparing the weights and flow rates of the samples of solids-laden liquid
10 and the centrate;
- 11 e. calculating the quantity of solids removed by the centrifuge.

1 20. The method of claim 19, wherein the solids laden liquid is drilling mud, and further
2 comprising the step of calculating the dilution costs of drilling mud saved by the system.

1 21. The method of claim 20, further comprising the steps of

- 2 a. determining the per unit cost of centrate; and
- 3 b. calculating the economic value of the centrate saved by the method.

1 22. The method of claim 19, further comprising the step of measuring the total discharge
2 of contaminants from the system.

1 23. The method of claim 22, further comprising the step of generating a report of the total
2 discharge of contaminants from the system.

1 24. The method of claim 19, further comprising the steps of:

2 a. processing the solids discharge in a cuttings drier to produce a drier fluids
3 discharge and a drier solids discharge; and

4 b. determining the flow rate of the drier fluids discharge.

1 25. The method of claim 24, further comprising the step of determining the economic
2 savings represented by the drier fluids discharge.

1 26. In a drilling mud reclamation system comprising a mud inlet line adapted to be
2 connected to a source of solids-laden drilling mud; a first stage pump provided with the mud
3 from the source; a first stage centrifuge to receive mud from the first stage pump and for
4 separating the heavy weight solid components from the mud and forming a first stage liquid
5 discharge; a second stage pump to receive the first stage liquid discharge; a second stage
6 centrifuge to receive the first stage liquid discharge from the second stage pump and for
7 removing lighter weight solid components in the first stage liquid discharge and for forming
8 a second stage liquid discharge and a second stage solids discharge defining a weight; and
9 a cuttings drier to receive the second stage solids discharge to produce drier liquid discharge
10 and a drier solids discharge; a monitoring and control system for the reclamation system
11 comprising:

12 a. a mass flow sensor for measuring weight of the second stage solids discharge;
13 and

14 b. a flow rate sensor for measuring the flow rate of first stage liquid discharge
15 through the second stage centrifuge;

- 16 c. a central processor adapted to receive signals from the mass flow sensor and
17 from the flow rate sensor.